Learning in the Labor Market: The Changing Importance of Education and Training After "Formal" Schooling Ends

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EXECUTIVE SUMMARY

While there is general agreement on the need to invest more in the continuing education and training of American workers, our knowledge about the importance of such investments and the relative value of various types of training is not well-formed. In this monograph, I attempt to improve our understanding of the importance of continuing education and job training. In particular, I undertake three tasks: (1) to identify trends in the patterns and value of training during the past three decades; (2) to examine whether certain types of training have become particularly valuable; and (3) to assess trends in access to training among groups of workers with different levels of education.

In doing so, I aim to determine whether the evidence is consistent with the general belief that demand changes in the labor market are increasingly rewarding training. Moreover, I hope to identify where and when training is particularly valuable, thereby helping to move the policy discussion past the ambiguous recommendation to "do more," to a more useful prescription about what to do. My final goal is to more directly assess whether training might be used as a policy mechanism to help reverse the declining economic fortunes of workers with limited formal schooling.

To understand the changes in the patterns and value of training during the past three decades, I make use of data from the National Longitudinal Surveys from 1966 to 1981 and the comparable National Longitudinal Survey of the Labor Market Experiences of Youth from 1979 to 1994 (NLS, collectively). The NLS offers an excellent source of information for the study of training. For each cohort, detailed information is available about work experience and about the amount and types of education and training workers engaged in after completing their formal education.

Using cohorts of comparably aged white men, I examined the patterns of training in which they engaged, and the effects of such training on the wages they earned and the hours they worked during the last year of available data. I estimated wage and hours effects of training using standard regression methods. I also introduced a number of controls for the possibility that training is associated with hard-to-measure attributes of workers and their jobs.

There are several principal findings:

- It is clear that training is associated with higher wages. On average, for both cohorts, participation in any form of training during the first decade and a half of one's career resulted in wage gains on the order of 7 to 10%. This increase is comparable to the earnings premium associated with an additional year or two of formal schooling.
- I find no evidence consistent with a substantial increase in employers' demand for trained workers during the past thirty years. The economic returns to training are high for a cohort of young men entering the labor market in the 1980s, and they were equally high for the cohort which entered in the late 1960s. At the same time, the

amount of training in which workers engaged fell slightly.

- The pattern of training associated with the highest returns is one of frequent, short-term training episodes. Participation in a long-term training program (one lasting more than one month) does not appear to provide any wage premium over and above shorter-term training. However, participation in multiple episodes of training has a high pay-off compared to participation in only one episode.
- For both cohorts, workers with a high school education or less who participated in training earned returns which were at least as high as, and often higher than, their more educated peers.
- Between cohorts, there was a shift in incidence of training so that among the later cohort, participation in training among high school graduates and dropouts lagged substantially behind the participation of those with at least some postsecondary education.

Together, these findings provide a number of lessons. First, it is clear that the learning in which workers engage once they leave school has an important effect on their earnings. Moreover, the finding that short-term training is as valuable as long-term training suggests that any public or private efforts to improve workers' skills and wages need not involve investment in long-term training. So, there is hope that training investments will not require major commitments of time, and perhaps money, in order to pay off. Rather than encouraging long episodes, a sound training investment policy should encourage frequent training throughout workers' careers.

It is also clear that training can be regarded as a useful policy instrument for those interested in improving the economic prospects of less-educated workers. Workers with a high school education or less who participated in training earned returns which were at least as high as their more educated peers. However, a growing bifurcation in access to training by education level suggests that there may be some serious obstacles which policies that hope to encourage training among workers without a postsecondary education will have to address.

Because training is indeed a useful mechanism for improving workers' wages, the apparent cleavage between those with and without some postsecondary education in access to training may be an inauspicious sign of future wage trends. Workers without postsecondary schooling have seen their wages fall in both real and relative terms during the past three decades. If such workers are increasingly shut-out of, or avoiding, valuable episodes of job training after they enter the labor market, these patterns are likely to be exacerbated.

INTRODUCTION

As the U.S. adapts to a more competitive global marketplace, education and training are increasingly seen as vital both as part of any national economic strategy and at another level as a mechanism to help assure individuals' economic well being. Moreover, a growing consensus suggests that education and training should not be limited solely to an intensive period prior to entrance into the labor force, but should be undertaken regularly throughout workers' careers. While many business leaders, analysts, and policymakers trumpet a need to invest more in the continuing education and training of American workers, our knowledge about the importance of such investments and the relative value of various types of such learning is not well-formed.

In this paper, I hope to improve our understanding of any developing importance of continuing education and job training (which I will generally refer to as "training"). In particular, I attempt to identify trends in the patterns and value of training during the past three decades. I do this with two goals in mind. The first is to determine whether the

evidence substantiates or refutes the general belief that more training would improve both our strategic economic position and the prospects of individual workers. If a case is to be made that investment in continued learning is ever more important, we should expect to see changes in the amount and value of such training which are consistent with a sizable demand shift.

My second aim is to provide a more detailed consideration of recent trends in both the access to and value of training. Here, I am interested in two principal aspects of any recent changes in training. First, I examine whether certain types of training have become particularly valuable. Understanding where and when training is particularly valuable can help move the policy discussion past the ambiguous recommendation to "do more," to a more useful prescription about what to do. Second, I assess trends in access to valuable training among groups of workers with different levels of education. This topic is important because much of the recent interest in training originated in its potential use as a tool to improve the skills and earnings of previously disadvantaged workers. If we are to understand whether training might help reverse the declining economic fortunes of workers with limited formal schooling, it is important to determine whether less educated workers are increasingly missing out on valuable training opportunities.

BACKGROUND AND APPROACH

During the past three decades, real earnings growth has largely been stagnant. This phenomenon has caused no small amount of worry among analysts and policymakers. This stagnation has seemed particularly worrisome since it followed nearly three decades of rapid growth in real earnings after World War II (Levy, 1986). But perhaps most disconcerting of all has been the real earnings losses experienced by millions of American workers, especially those without substantial levels of formal education. (For discussions of trends in wages and earnings during the past thirty years, see Levy & Murnane, 1992.)

Among the most accepted explanations by economists for the changes observed in the structure of earnings during the past three decades is that demand is increasingly favoring more skilled workers. Beyond its credence with economists, this explanation has been compelling among policymakers as well, for whom the preferred response to declining wages at the bottom of the distribution has been to prescribe more training. Indeed, to suggest that a consensus has developed among economists, policymakers, and the public that training is more important than ever is neither brave nor novel.

While it is widely believed that training is more important than ever, we have little direct evidence that demand has shifted in favor of the more trained. One source of indirect evidence consistent with a growth in the importance of training has been the well-described increase in the value of formal schooling. During the past two decades, returns to virtually every level of formal education have risen. For example, the value of a postsecondary education over a high school degree has risen, as has the penalty for failure to complete high school.

It is not immediately clear, however, that a growing demand for formal schooling provides sufficient evidence to conclude that the demand for job training taken after entering the labor market has risen as well. Such a conclusion depends on whether or not job training is a good substitute for formal schooling. Nonetheless, the literature on training has established that receipt of training is associated with higher wages (or earnings). Researchers using a variety of nationally representative datasets, as well as company level data, have overwhelmingly found that training had a positive effect on compensation (e.g., see Bartel, 1995; Brown, 1989; Lillard & Tan, 1986; Lynch, 1992; Mincer, 1991).

While training is clearly valuable, determining whether we have observed an increase in demand for the skills workers might learn by undertaking additional job training is inherently a question about trends. If training is to be thought of as an increasingly important investment either for workers or for the nation, we must understand whether we have observed changes in the labor market consistent with an increase in demand for trained workers. Bowers and Swaim (1994) and Constantine and Neumark (1996) provide two of the few attempts to assess whether we have observed an increase in the returns to training. Using the Current Population Survey (CPS), Bowers and Swaim find evidence that the returns to some types of training increased between 1983 and 1991, while the returns to other types fell. Constantine and Neumark also use the CPS, and find no important increases in training returns over the same period.

This paper is an attempt to add to the insight provided by these two papers into the importance of training over time. I hope to assess changes in the importance of job training in the United States during the past three decades by examining a different sample of workers. Using data from the National Longitudinal Surveys (NLS), I compared the extent to which two cohorts of young men engaged in training after entering the labor market and subsequent effects on their respective employment outcomes. The NLS data allow observation of training patterns over a much longer period of time than is possible with the CPS. Moreover, the NLS data often provide richer detail about the training in which workers engage than is generally available using the CPS.

Below, I begin this monograph by describing the NLS data in more detail. I describe both the richness of the information available on the training in which workers engaged, and several important limitations of the data. I then assess the extent to which patterns of and returns to training during the past thirty years are consistent with a demand shift that favored trained workers. I do this by first examining trends in the incidence of training, and then trends in associated returns. My second aim is to provide insight into when and for whom training can improve economic outcomes. I do this by first examining returns to different patterns and types of training among all workers. My aim here is to identify the patterns of training which appear to be most advantageous to workers, and to learn whether and how such patterns are changing. I then examine the patterns and value of training received by different groups of workers. This final section seeks to identify whether workers with different levels of formal schooling are engaging in and being rewarded for training in similar ways.

DATA

To understand the changes in the patterns and value of training during the past three decades, I make use of data from the National Longitudinal Surveys from 1966 to 1981 and the comparable National Longitudinal Survey of the Labor Market Experiences of Youth from 1979 to 1994 (NLS, collectively). The NLS offers an excellent source of information for the study of training. For each cohort, detailed information is available about work experience and about the amount and types of education and training workers engaged in after completing their formal education. For example, workers were regularly asked to identify the types and duration of any continuing education or training in which they engaged between interviews. Moreover, these data provide information about where workers received their additional training (e.g., at a community college, vocational institute, or at their places of employment).

Sample Information

For my purposes, I examined the experiences of a sample of young men surveyed annually as part of NLS's original cohort of young men (NLS-OC). Beginning in 1966, the NLS-OC interviewed 5,225 men between the ages of 14 and

24. These men were interviewed in person or by telephone during all but four years until 1981, when their ages ranged from 28 to 39.

I compared the experiences of young men from this original cohort to the experiences of young men beginning their careers in the late 1970s and early 1980s. I drew this sample of younger men from the National Longitudinal Survey of the Labor Market Experiences of Youth (NLSY). Beginning in 1979, the NLSY surveyed 12,686 men and women whose ages ranged from 14 to 21. These men and women have been interviewed annually, in person or by telephone, each year since then.

Drawing on the NLS-OC and NLSY, I was able to examine the patterns of training in which two comparable cohorts engaged during the early years of their careers. Moreover, these data allowed me to assess the importance of such training on the earnings of each cohort.

I restricted my focus for this paper to a comparably aged group of white men from each sample. I limited my analysis to men because dramatic changes in rates of labor force participation among women between the 1960s and early 1990s confound any inferences that can be drawn about the relationship between training and the earnings of women between these cohorts.

I restricted my analysis to whites because of a very high rate of sample attrition for blacks in the NLS-OC. Overall, the NLS-OC had a retention rate of 64.9% by the final interview in 1981. This is lower than the 89.3% retention rate for the NLSY sample by the 1994 survey. While the overall rate of attrition was relatively high among the first cohort, the rate at which black respondents failed to be interviewed from year to year was especially bad. As an illustration, for the NLS-OC, 73% of white respondents were interviewed in at least nine of the twelve years during which the cohort was interviewed. Among the NLSY cohort, 82% of white respondents completed at least nine interviews. For blacks, however, completion rates were substantially different between cohorts. Among the NLS-OC cohort, only 56% of respondents completed nine interviews. This compares poorly to the 89% of black respondents completing at least nine interviews during the NLSY survey. Because of these relatively stark differences in rates of non-interviews for blacks between cohorts, I chose to focus on white workers, for whom interview rates are more comparable from one cohort to the next.

I limited my analysis of the NLSY data to the cross-sectional sample designed to be representative of the population 14 to 21 years old in 1979. The NLSY also included a number of supplemental samples designed to collect detailed information on populations which otherwise might be represented in too small numbers to explore certain research questions. These included oversamples of poor whites and of young people in the military. The NLS-OC sample included no such oversampling of poor youths or of those in the military, instead drawing a sample designed to be nationally representative of the population 14-24 years old in 1966. In order to ensure comparability, I use only those portions of the NLS-OC and NLSY samples designed to be nationally representative.

Furthermore, because the age range of the NLS-OC cohort is broader than the NLSY cohort, I dropped sample members of a certain age from the NLS-OC cohort. I ended up with samples that were comparably aged (28 to 36 years old) in the final years which I am considering (1981 for the NLS-OC and 1994 for the NLSY). In Table 1, I present descriptive statistics on the NLS-OC and NLSY samples in 1981 and 1994, respectively.

Table 1
Sample Means, NLS-OC and NLSY Cohorts

	NLS-OC	NLSY
Hourly Wage (1994 Dollars)	16.96	15.15
	7.15	*10.46*
Age	33.31	33.27
	2.18	*2.13*
Proportion High School Dropouts	.091	.100
	.007	*.008*
Proportion High School Graduates	.305	.441
	.012	*.013*
Proportion with Some College	.240	.189
	.011	*.010*
Proportion College Graduates	.363	.270
	.012	*.011*
Proportion Married	.762	.676
	.011	*.012*
Proportion Represented by Unions	.302	.112
	.012	*.008*
Proportion Full-Year, Full-Time	.802	.746
	.010	*.011*
Proportion in an SMSA	.746	.761
	.011	*.011*
Proportion Living in the South	.296	.310
	.012	*.012*
Proportion Veterans	.399	.116
	.013	*.008*
Unweighted Final Sample Size	**1,530**	**1,561**

Note: All means and proportions are estimated using appropriate sampling weights.

Two important differences in the characteristics of the cohorts are notable. First, the second cohort is less educated than the first. Clearly, the educational attainment of the general population has been rising during the twentieth century; however, the flood of highly educated young people into the labor market as the baby boom left college during the 1970s bid down relative wages for more educated workers, especially among the young. Subsequently, the rate of college entrance among high school graduates in the 1980s fell as college became less appealing. As a result, during a time of rising general levels of education, educational attainment for the cohort of men leaving high school in the late 1970s and early 1980s fell compared to their immediate predecessors (U.S. Census Bureau, 1996).

The second important difference between cohorts is the lower rate at which members of the second cohort served in the armed forces. A full 39.9% of young men in the first cohort report serving in the armed forces by 1981 compared to only 11.6% of the second cohort by 1993. This difference is an artifact of the Vietnam War. [1] The workers I examined from the NLS-OC data were just coming out of high school during the peak years of Vietnam-era conscription. Indeed, 14% of the men in the first cohort reported having been in combat. I attempt to account for these differences between cohorts by including controls for veteran status in all models estimated below. Furthermore, I included a dummy variable set to one for all members of the original cohort who report having served in combat. [2] To the extent there is any larger cohort effect due to the Vietnam War, these controls may be inadequate, and the reader is urged to interpret the results in the context of his or her own assessment of the impact of such an event on the learning and earnings of the respective cohorts.

Information on Continuing Education and Job Training

To collect information on the continuing education and job training in which the young men in each of the samples have engaged, I make use of their responses during the full series of interviews. During the course of the NLS-OC, respondents were routinely asked about the educational programs or training courses they had taken other than their regular schooling. Respondents were informed that such training could have been taken either at work or elsewhere. Similarly, respondents to the NLSY surveys were routinely asked about the training they received other than regular schooling. In each case, respondents were asked only about the training they had engaged in since the last interview (with the exception of the first interview administered).

Both the NLS-OC and NLSY provide rich information about the training in which respondents engaged. This information includes the source of training, such as vocational-technical and community colleges; training provided at the place of work either by the employer or by an outside trainer; and government-sponsored training. [3] Respondents are also asked other details about their training such as its duration and frequency. From this information, I was able to construct a detailed history of individuals' participation in training, including the type, frequency, and duration of the training in which they engaged over the thirteen-year period prior to interview. [4] More details about the questions asked of respondents in each sample are provided in Appendix 1.

While both the NLS-OC and the NLSY provide rich sources of data about the amount and types of training undertaken by young men in each of these cohorts, there is an important difference between these two surveys. While the NLS-OC contains a series of questions about training that is largely consistent over time, sample members were not interviewed every year. The NLSY, however, did attempt to interview its sample members annually. This difference in interview intervals can affect the inference drawn about trends in the incidence of training.

Each survey asked respondents about the training in which they engaged since the date of their last interview. For four of the ten NLS-OC interview years used here, the training questions asked respondents to describe the training in which they engaged over the preceding two-year period. [5] During the other six NLS-OC interview years, the training questions referred to training during the one year preceding the interview. For the NLSY, however, in only one interview year (1988) were respondents asked about training over the preceding period of at least two years. In all other years, the relevant period was only approximately one year in length.

These differences in interviewing patterns means that studying trends in training between cohorts requires that I had to rely disproportionately on the original cohort's ability to recall training which occurred over longer periods. There is no fully satisfying way to determine the effect of these different recall periods on the amount of training reported by each cohort. For both cohorts, more training was reported at interviews following a two-year interval since the last interview,

and for both cohorts the incremental increases in reported training associated with the two-year interval are very similar. [6] Because of its length, we would expect an increase in reported training following a two-year interview interval; however, I am unable to determine whether the observed increase sufficiently captures all of the training respondents engaged in over the longer interview interval, or if training is more likely forgotten if it occurred sometime in the past two years, rather than the past one year.

If there is any substantial additional inability to recall whether or not an individual participated in training during the past two years, rather than the past one year, I will likely under-count the training in which the original cohort engaged. As we will see, however, this potential under-counting of training among the original cohort does not affect the principal conclusions about trends in training. That is, I observed no real increase in training incidence consistent with a growing demand for skilled workers. Any differential under-counting would only reinforce this conclusion.

RESULTS

Trends in Training Incidence

The patterns of training reported by the NLS-OC and NLSY cohorts are summarized in Table 2. During the course of their interviews, 68.5% of NLS-OC cohort members reported participating in a training course or educational program other than regular schooling at least once. Among the NLSY cohort, 63.8% reported participation in training at some time. Clearly, for both cohorts, at least some level of participation in training is common.

Table 2
Incidence of Training by Cohort

	Original Cohort	**NLSY Cohort**
Ever Participated in Training	68.5%	63.8%
Participated in Short-Term Training	17.0%	29.0%
Participated in Long-Term Training	51.4%	34.8%
Long-Term Training Provided at Company	17.3%	15.6%
Long-Term Training Provided at School	14.8%	7.7%
Long-Term Training Provided Elsewhere	9.8%	6.2%
Multiple Sources of Long-Term Training	9.5%	5.3%
Total Number of Years in Which Training Occurred	1.91	1.79

Moreover, long-term training is common for each cohort. However, among the NLSY cohort, the training in which workers reported engaging appears to be shorter than among their counterparts in the earlier cohort. In the NLS-OC cohort, 51.4% reported participation in a training program that lasted at least one month, while 17.0% reported

participating in a shorter program. Only 34.8% of the NLSY cohort reported receiving training lasting more than one month, while 29.0% reported training of a shorter duration. [7]

Not only was there a shift toward short-term training, but there was also a mild decline in the frequency with which workers reported receiving training between cohorts. The number of years in which respondents reported training declined from an average of 1.91 years to an average of 1.79 years. Combined with the decline in incidence, the fall in frequency and duration meant that the second cohort engaged in less training than the first.

As a part of the overall decline in the incidence of long-term training between cohorts, among those receiving long-term training there was also an interesting shift in the sources of such training. [8] While the proportion of young men participating in long-term training fell by about one-third between cohorts, there was a particularly large drop in participation in such training provided at schools (e.g., business or community college, vocational/technical institute, barber or beauty school, or flight school). The proportion participating in company-provided long-term training fell hardly at all, while at the same time, the proportion engaged in long-term training at schools fell by about one-half.

Trends in the Wage Effect of Training

While the incidence of training differed somewhat from the first cohort to the second, the economic returns to such training remained largely stable. In Table 3, the results of a series of models that estimate the effects of past episodes of training on the real hourly wages of the first cohort in 1981 and of the second cohort in 1994 are summarized. The first two columns in the table present the marginal effects of experience and educational status on wages for each cohort. Each subsequent pair of columns presents the results of models that modify the basic specification to include alternative characterizations of the relationship between training and wages.

Table 3
Returns to Training, NLS-OC and NLSY Cohorts

	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**	
	NLS-OC Cohort	**NLSY Cohort**	**NLS-OC Cohort**	**NLS-OC Cohort**	**NLS-OC Cohort**	**NLSY Cohort**	**NLSY Cohort**	**NLSY Cohort**	**NLS-OC Cohort**	**NLSY Cohort**
Intercept	1.858*	1.710*	1.825*	1.670*	1.825*	1.667*	1.865*	1.646*	1.835*	1.676*
	0.077	*0.094*	*0.078*	*0.095*	*0.078*	*0.095*	*0.077*	*0.096*	*0.077*	*0.095*
Potential Experience	0.030*	0.019*	0.029*	0.019*	0.029*	0.019*	0.026*	0.020*	0.028*	0.018*
	0.004	*0.006*	*0.004*	*0.006*	*0.004*	*0.006*	*0.004*	*0.006*	*0.004*	*0.006*
High School Dropout	-0.375*	-0.317*	-0.355*	-0.300*	-0.356*	-0.298*	-0.329*	-0.295*	-0.352*	-0.295*
	0.042	*0.048*	*0.042*	*0.048*	*0.042*	*0.048*	*0.043*	*0.048*	*0.042*	*0.048*
Some College	0.163*	0.170*	0.163*	0.161*	0.163*	0.160*	0.163*	0.149*	0.160*	0.161*
	0.030	*0.036*	*0.030*	*0.036*	*0.030*	*0.036*	*0.030*	*0.036*	*0.030*	*0.036*
College	0.424* *0.034*	0.441* *0.043*	0.419* *0.034*	0.430* *0.043*	0.416* *0.034*	0.425* *0.043*	0.419* *0.034*	0.426* *0.043*	0.412* *0.034*	0.424* *0.044*

Ever Received Training	-	-	0.071*	0.105*	-	-	-	-	-	-
	-	-	*0.024*	*0.027*	-	-	-	-	-	-
Duration										
Long-Term Training	-	-	-	-	0.065*	0.089*	-	-	-	-
	-	-	-	-	*0.025*	*0.031*	-	-	-	-
Short-Term Training	-	-	-	-	0.086*	0.124*	-	-	-	-
	-	-	-	-	*0.030*	*0.033*	-	-	-	-
Frequency: Number of Years in Which Training Occurred										
One Year	-	-	-	-	-	-	0.046	0.063*	-	-
	-	-	-	-	-	-	*0.028*	*0.033*	-	-
Two or Three Years	-	-	-	-	-	-	0.068*	0.102*	-	-
	-	-	-	-	-	-	*0.026*	*0.034*	-	-
Four or More Years	-	-	-	-	-	-	0.164*	0.199*	-	-
	-	-	-	-	-	-	*0.034*	*0.041*	-	-
Source of Training										
Long-Term Training Received at Company	- -	- -	- -	- -	- -	- -	- -	- -	0.107* *0.026*	0.116* *0.035*
Long-Term Training Received at School	- -	- -	- -	- -	- -	- -	- -	- -	0.017 *0.026*	0.063 *0.041*
Long-Term Training Received at Other Source	- -	- -	- -	- -	- -	- -	- -	- -	0.015 *0.037*	-0.004 *0.055*
Short-Term Training	-	-	-	-	-	-	-	-	0.089*	0.121*
	-	-	-	-	-	-	-	-	*0.0287*	*0.032*
R-square	0.2418	0.2604	0.2463	0.2678	0.2466	0.2680	0.2536	0.2723	0.2524	0.2712

Wages measured in log form

All models include controls for marital status, SMSA residence, residence in the South, union status, FYFT status, veteran status (and combat experience for the Original Cohort), and a set of industry of employment dummies.

* Significant at 5% level

The second set of columns in Table 3 replicates the first model, but includes an indicator of whether or not a worker ever participated in training. [9] For the first cohort, training resulted in an average wage premium of 7.1%. The training premium for the second cohort was 10.5%. While the point estimate of training returns was higher for the second cohort, the difference was not statistically significant. So, while it can be concluded that for each cohort training has a significant positive effect on wages, the hypothesis that training returns were equal for the two cohorts cannot be rejected.

Besides the stability of the estimated training returns between the two cohorts, two things are noteworthy. The first is the size of the training return. A 7-10% return on training is large, and suggests that participating in training once in the labor market pays off well. This estimate of the returns to training suggests that there might be reason for optimism that encouraging training might improve the earnings of workers who are falling behind. Second, including a measure of training marginally reduces the effect of education on earnings. This suggests that part of the observed return to formal schooling is due to higher incidence of training among better-educated workers.

The results presented in Table 3 were obtained while employing standard human capital and job controls. It may be the case, however, that workers who engage in training are different from those who do not in other ways not measured here. For example, unusually able or ambitious workers may be given training by employers or seek training on their own. Such characteristics may themselves affect wages. If not properly measured, their influence may be confounded with estimates of training returns. I examined the effects of such potential heterogeneity in different ways. In no case did I find that the estimated training returns presented in Table 3 were influenced by such heterogeneity in any important way. Because estimated training returns were robust, I present only the OLS results here for the sake of clarity. In Appendix 2, I discuss the issue of heterogeneity further and present evidence of its importance.

The final six columns in Table 3 present the results of three different ways of characterizing the relationship between training and wages. The first two attempt to measure the effect of duration and frequency of training. The first of these models has the basic controls for human capital and includes two mutually exclusive measures of training: (1) an indicator of whether a worker participated in training which lasted more than one month, and (2) an indicator of whether a worker participated in training, but never in a time period of more than a month. Interestingly, for neither cohort did longer-term training result in better wage outcomes. This could be due to the possibility that longer-term training may be remedial, or that there are diminishing returns to training. As with the earlier results, there is no evidence that the returns to training increased from one cohort to the next.

The next model includes a series of variables that measure the number of years in which a worker reports participating in training. For both cohorts, wages rise most for workers who engaged in training during more than one year. For the first cohort, wages for workers who participated in training during one year are not significantly higher than the wages of those who did not participate in training at all. However, for workers who participated in training during two or three years, wages were 6.8% higher than those with no training. The earnings of those participating in training during four or more years were 16.4% higher than those without training. A similar pattern of very high returns for those who participate in the most frequent training is observed among the second cohort.

One explanation for this pattern of higher returns among those who participate in training often suggests that the observed association between earnings and frequent training may have nothing to do with the training itself. Instead, it may be due to the possibility that workers who receive frequent training are receiving frequent promotions. So, some workers may be put on a "management track," and their frequent training could be a consequence of their new position and pay, rather than an antecedent to promotion.

Because I was able to observe individuals' work histories, I tested the hypothesis that promotion, rather than frequent job training, accounts for this pattern of earnings. I found that controlling for the frequency of promotion has negligible effects on the estimated returns for job training in general or for frequent job training. I interpret these results as confirmation that frequent job training has a high return, independent of any patterns of intra-firm job changes that may be associated with such training.

The final model attempts to measure the relative impact of different sources of training on earnings. Because of data limitations, I was only able to compare the source of training for workers reporting training of more than one month in duration. Consistent with the results of Model 3, for both cohorts, short-term training has a return at least as high as long-term training, regardless of the source of long-term training. Among those who participated in long-term training, training received at a worker's company had the highest return.

Long-term training outside of the workplace appears to have had no significant wage effect. Moreover, these patterns held for both cohorts. Such training includes training received at schools such as business or community colleges, vocational/technical institutes, barber or beauty schools, or flight schools. It also includes training reported at other sources. This finding does not mean that training at sources other than workers' places of employment is not valuable. Because of data limitations, I can say nothing of the relative value of training provided from such sources which is short in duration; however, it does appear that longer-term training provided outside the workplace did not generate significantly higher wages.

Together, these results provide an interesting picture of the effect of training on workers' wages. The first lesson is that, on average, training matters quite a bit. The second lesson is that workers who receive training that is long in duration do not fare better than those who receive shorter training. Rather, it is frequency, not the duration of any one training spell that most determines the economic returns to training. Finally, these patterns have not changed between cohorts.

Trends in the Effect of Training on Hours Worked

Beyond an hourly wage premium, training may also influence workers' well-being by affecting the number of hours worked. Training might have an hours effect for a variety of reasons. Chief among these is that by increasing productivity, we anticipate training to increase demand by firms for workers' services. For any individual worker who has received training, this could mean an increase in the number of hours worked. Additionally, by increasing productivity and wages, training may generate a substitution effect that leads some workers to work longer hours. Moreover, workers may work additional hours so as to increase the period over which they reap the benefits of training investments.

In order to examine the effects of training on hours, I estimated a series of hours equations based on models similar to those presented in Table 3. That is, I estimated models in which I first examine the effect of a yes/no indicator of any training on annual hours worked for the original cohort in 1981 and the NLSY cohort in 1994. I then sequentially expanded this model to examine the effect of training intensity, frequency, and source on annual hours. I present the results of the estimation of these models of annual hours in Table 4.

The principal conclusion to be drawn from Table 4, in comparison with Table 3, is that the effect of training on employment outcomes primarily operates through the wage rate, rather than through hours of employment. The marginal effect of any training on hours is similar for the two cohorts--69.5 for the original cohort and 63.7 for the NLSY cohort. Only for the NLSY cohort, however, is this significant. For the NLSY cohort, this suggests that participation in any training leads to an increase in annual hours worked by 2.8%.

The models relating short- and long-term training to annual hours, and training frequency to annual hours suggest effects similar to those of training on hourly wages, but more muted. The only instance where the hours models suggest a relationship which is sizable and notable in its difference from the earlier wage models appears in the model relating training to hours, by source of training (Model 5). For both the original and the NLSY cohorts, it appears that long-term training received at a school had a large and significant effect on annual hours.

School-provided long-term training increased annual hours by 94.9 for the original cohort and by 109.4 hours for the NLSY cohort. This effect amounted to about a four to five percent increase in hours worked for those receiving such training. No other sort of training affected hours similarly. This pattern differs importantly from the effect of different sources of training on wages. Remember from Table 3 that company-provided long-term training (and short-term training, in general) had significant effects on wages, while school training did not. The results in Table 4 suggest that school-provided long-term training does, however, have effects on employment outcomes via hours worked.[10]

Table 4
Training Effects on Annual Hours Worked, NLS-OC and NLSY Cohorts

	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**	
	NLS-OC Cohort	**NLSY Cohort**	**NLS-OC Cohort**	**NLS-OC Cohort**	**NLS-OC Cohort**	**NLSY Cohort**	**NLSY Cohort**	**NLSY Cohort**	**NLS-OC Cohort**	**NLSY Cohort**
Intercept	2247*	2105*	2215*	2082*	2215*	2077*	2252*	2048*	2234*	2090*
	123	*114*	*124*	*115*	*124*	*116*	*124*	*117*	*124*	*115*
Potential Experience	0.3	3.0	-0.9	2.5	-0.9	2.6	-2.9	3.8	-1.6	2.2
	7.1	*6.7*	*7.1*	*6.7*	*7.1*	*6.7*	*7.2*	*6.7*	*7.1*	*6.7*
High School Dropout	-25.7	-115.0*	-5.7	-1.3	-5.2	-104.0	12.6	-99.7	1.4	-98.5
	71.7	*56.9*	*72.0*	*57.0*	*72.5*	*57.2*	*73.2*	*57.1*	*72.5*	*57.2*
Some College	11.6	-9.6	10.7	-15.8	10.8	-16.2	12.0	-21.8	10.8	-10.3
	47.2	*43.4*	*47.0*	*43.5*	*47.2*	*43.6*	*47.1*	*43.7*	*47.1*	*43.6*
College	-26.3	121.0*	-30.3	114.0*	-29.4	111.0*	-28.2	111.0*	-30.1	121.0*
	52.9	*51.7*	*53.0*	*51.7*	*53.1*	*52.0*	*52.9*	*51.7*	*53.1*	*52.5*
Ever Received Training	-	-	69.6	63.7*	-	-	-	-	-	-
	-	-	*37.5*	*32.0*	-	-	-	-	-	-
Duration										
Long-Term Training	-	-	-	-	71.9	53.7	-	-	-	-
	-	-	-	-	*39.5*	*36.7*	-	-	-	-
Short-Term Training	-	-	-	-	64.0	76.8*	-	-	-	-
	-	-	-	-	*47.2*	*39.2*	-	-	-	-

Frequency: Number of Years in Which Training Occurred										
One Year	-	-	-	-	-	-	39.6	75.0	-	-
	-	-	-	-	-	-	*44.5*	*40.4*	-	-
Two or Three Years	-	-	-	-	-	-	49.6	74.3	-	-
	-	-	-	-	-	-	*41.6*	*40.8*	-	-
Four or More Years	-	-	-	-	-	-	141.4*	118.2*	-	-
	-	-	-	-	-	-	*53.3*	*49.1*	-	-
Source of Training										
Long-Term Training Received at Company	- -	- -	- -	- -	- -	- -	- -	- -	42.9 *40.7*	15.0 *41.8*
Long-Term Training Received at School	- -	- -	- -	- -	- -	- -	- -	- -	94.9* *41.1*	109.4* *49.6*
Long-Term Training Received at Other Source	- -	- -	- -	- -	- -	- -	- -	- -	-35.6 *59.5*	-21.6 *66.6*
Short-Term Training	-	-	-	-	-	-	-	-	57.1	68.8
	-	-	-	-	-	-	-	-	*45.4*	
R-square	0.0361	0.0877	0.0376	0.0902	0.0376	0.0904	0.0402	0.0923	0.0417	0.0927

All models include controls for marital status, SMSA residence, residence in the South, union status, FYFT status, veteran status (and combat experience for the Original Cohort), and a set of industry of employment dummies.

* Significant at 5% level

Incidence and Returns by Education Group

It is clear that participation in job training after entering the labor market is associated with better employment outcomes on average. Training has a substantial effect on hourly wages, and a small effect on hours worked. However, there do not appear to be any systematic changes in the amount of training or the returns to training over the past thirty years which are consistent with any substantial increase in demand. As such, while it might be reasonable to conclude that encouraging training can have positive effects on economic outcomes, it does not appear that relatively stagnant earnings growth can be attributed to an underinvestment in increasingly important skills associated with training.

Nonetheless, the question remains open about whether the declining economic fortunes of workers with limited levels of formal schooling is partly due to a mal-distribution of valuable training to different groups of workers. I next examined whether the trends in overall training incidence and returns described above mask any important differences in the patterns and value of training various groups receive.

In Figure 1, estimates of the proportion of each cohort reporting participation in training by level of formal education are presented. Each bar provides information about the proportion of workers with various levels of education in each cohort participating in long- and short-term training. Two things are notable. First, for each education group, there was a significant drop in the proportion participating in long-term training. So, for each education group, regardless of any changes in the incidence of any training, there was a sizable shift toward less intensive training over time.

Second, for all workers except those with a high school education, there was no change in the incidence of training between cohorts. However, among those with a high school education, there was an important decline in the proportion of workers participating in training between cohorts. Interestingly, for the original cohort, access to training among high school educated workers looked much like the access enjoyed by their more educated peers. For that cohort, a secondary or postsecondary education was associated with fairly high and virtually identical rates of training. The only impact of education on training appears to have been due to the much lower rate at which high school dropouts participated in training.

Figure 1
Training Incidence by Education Level:
NLS-OC (column 1) and NLSY (column 2)

Among the second cohort, patterns of training by education had changed slightly. For the later cohort, training incidence among high school graduates started looking less like the incidence of those with some postsecondary schooling and more like high school dropouts. To be sure, high school graduates continued to participate in training at a greater rate than dropouts; however, it appears that among the later cohort, postsecondary schooling serves as a more important key for access to training.

It appears that postsecondary schooling serves as a more important determinant of another dimension of training among the second cohort. Specifically, between cohorts there was a relative shift in incidence of frequent training that favored workers with at least some postsecondary education. Figure 2 illustrates this shift by separating workers with different levels of formal schooling who ever received training into three different groups: (1) those who received training only once; (2) those who received training two to three times; and (3) those who received training four or more times. The first two pairs of charts represent patterns of training frequency among workers in the first and second cohort without any postsecondary schooling. For these groups there was a small shift away from participation in training at least four times. For those with a high school education, there was also a drop in the proportion participating in training during two or three different years. So, by the second cohort, there had been a sizable increase in the likelihood that high school graduates who participated in training had engaged in such training only once. Combined with the above finding that overall and long-term training incidence declined markedly for high school graduates, this decline in frequency suggests that high school graduates in the second cohort engaged in significantly less training than did their peers in the earlier cohort.

By itself, this decline in training incidence and frequency among those with no postsecondary education may have had an effect on their relative earnings during the past several decades. To better understand changes in how relative wage outcomes have changed over time, however, it is also important to examine relative returns to training over time. In Table 5, estimates of the marginal effects of any training on real hourly wages for members of each cohort, estimated separately for those with and those without any postsecondary education, are presented. Estimates of both the wage effect of any training and the effects of participation in training during only one year, participation in training in two to three years, and participation in training in four or more years, are also included.

Figure 2
Number of Years Trained Workers Report Participation in Training: By Education

Table 5
Returns to Job Training by Cohort and Education Level

Education Level		**Original Cohort**	**NLSY Cohort**
Workers with No Postsecondary Education	OLS-estimated return to any training	.125*	.159*
	OLS-estimated return to different amounts of training	*.034*	*.035*
	Training in one year	.044	.088*
		.042	*.042*
	Training in two or three years	.112*	.133*
		.040	*.045*
	Training in four or more years	.244*	.282*
		.048	*.059*
Workers with Some Postsecondary Education	OLS-estimated return to any training	.076*	.088*
	OLS-estimated return to different amounts of training	*.033*	*.044*
	Training in one year	.080*	.070
		.039	*.057*
	Training in two or three years	.085*	.090
		.036	*.055*
	Training in four or more years	.161*	.160*
		.049	*.062*

* Indicates significance at .05 level

Two interesting results are apparent in Table 5. The first is that training returns are higher for those with no postsecondary education. One interpretation of this is that workers are not being excluded from valuable training experiences because of a lack of formal schooling. [11] This suggests that less educated workers are able to use training as a substitute for formal education. This is a lesson that provides hope that training can reasonably be used as a mechanism for improving the economic outcomes of those with only a high school education or less.

The second finding apparent in Table 5 is that there was little change between cohorts. For both cohorts, training paid off for workers both with and without a postsecondary education. While there were mild increases in the average returns for training among both groups, these changes were not statistically significant. Also, for both cohorts, frequent participation in training pays off particularly well.

CONCLUSION

The finding that certain types of training pay off well for workers with and without a postsecondary education serves as a good point of departure for summarizing the present empirical findings. While it is clear that training is associated both with higher wages and increased annual hours of work, I found no evidence consistent with a substantial increase in employers' demand for trained workers during the past thirty years. The economic returns to training are high for a cohort of young men entering the labor market in the 1980s, and they were equally high for the cohort that entered in the late 1960s.

Even though the evidence from the NLS does not support the claim that training is becoming a more important determinant of economic outcomes, it is apparent that training plays a very important role in shaping economic well-being. On average, for both cohorts, participation in any form of training during the first decade and a half of one's career resulted in wage gains on the order of seven to ten percent. This increase is comparable with the earnings premium associated with an additional year or two of formal schooling.

Possibly more important among the present findings than the magnitude of average training returns is insight into the patterns and types of training which are particularly valuable. Notably, among workers who received training which lasted at least one month, it appears that for both cohorts only training received directly at the workplace has substantial economic returns. For both the original and NLSY cohort, long-term training received at a community college or school appears to have a relatively low return. This relative effectiveness of employer-provided training may be due to the possibility that such training is more effectively focusing on job-relevant skills. Moreover, learning in the workplace may provide trainees with a tangible context for the application of new skills and thereby improve learning.

The relatively lower wage benefit associated with training not provided by the employer may also be due to the possibility that participation in longer-term training at a place other than the workplace is more common among workers employed by smaller firms. Such firms may also pay relatively poorly, and, as a consequence, lower wages associated with such training would be observed in the short-run. However, this finding holds even when controls for firm size are included, which suggests the low value for non-employer-provided training is not simply an artifact of firm size.

Regardless of where long-term training occurs, participation in such a training program does not appear to provide any

wage premium over and above shorter-term training. That is, while longer-term training is associated with higher wages, it is not associated, on average, with wages higher than those received by comparable workers who had engaged in only short-term training. There are several possible interpretations of this result. It may be that workers who participate in longer-term training are in need of remediation. [12] Alternatively, it may be the case that there are diminishing returns to training, or perhaps any beneficial effects of structured long-term training may be offset by a growing penalty associated with extended periods of absence from one's usual work duties.

However, regardless of the interpretation, the policy implication of this finding is promising. Because short-term training is as valuable as long-term training, it appears that any public or private efforts to upgrade workers' skills and wages need not involve investment in long-term training. This suggests that training investments need not involve major commitments of time, and perhaps money, in order to pay off.

If there is any evidence to suggest that workers who engage in substantial amounts of training do better than those who do not, it is in the form of a very large premium associated with frequent training, rather than long-term training. I estimate that the economic return to participation in frequent training for both the original and youth cohort is quite high, and remains high upon inclusion of controls for ability and promotion frequency. Together with the result that long-term training has no marginal benefits over short-term training, the pattern of training which emerges as the most valuable during the early stages of a person's career is one of frequent, short-term training episodes. This pattern is consistent with the need for minor but continual updating of skills.

It also appears that a postsecondary education is not a prerequisite for access to valuable training opportunities. For both the original and youth cohorts, workers with a high school education or less who participated in training earned returns which were at least as high as, and often higher than, their more educated peers. This suggests that training should be regarded as a useful policy instrument for those interested in improving the economic prospects of less-educated workers.

The difficulty associated with this strategy however, will involve improving access to training for less educated workers. While there was a mild fall in the overall incidence of training between cohorts, the only group which saw a large decline in training participation was high school graduates. As a result, among the later cohort, participation in training among high school graduates and dropouts lagged behind the participation of those with at least some postsecondary education. Because training is indeed a useful mechanism for improving workers' wages, the apparent cleavage between those with and without some postsecondary education in access to training may be an inauspicious sign of future wage trends. Workers without postsecondary schooling have seen their wages fall in both relative and absolute (real) terms during the past three decades. If these workers are increasingly shut out of or avoiding job training after they enter the labor market, we can likely expect an exacerbation of this trend.

Finally, while the present findings are suggestive of an important role of training in shaping recent trends in the wage structure, these findings and their implications must be recognized as limited. Because of the limitations imposed by inter-cohort comparisons of the NLS data, I have been unable to assess the effects of training on the relative wages of women and non-white workers. Developing a full sense of how access to training and its subsequent economic rewards has influenced earnings requires that the experiences of these workers be incorporated into the analysis.

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APPENDIX 1
COMPARISON OF NLS-OC AND NLSY QUESTIONS ABOUT TRAINING

Because this paper relies on comparisons between responses to questions about training by two different cohorts, it is

important to compare the NLS-OC and NLSY training questions to one another. In general, both cohorts are asked similar batteries of questions about training after they have been asked about their formal schooling.

The NLS-OC survey usually begins its series of questions about training with a principal question:

"Other than regular schooling, since {date of last interview}, have you taken any training courses or educational programs of any kind, either on the job or elsewhere?" [13]

The NLSY cohort was asked the following question between 1979 and 1986:

"Besides the training we've already talked about, since {date of last interview}, have you received training from any other source, such as the kinds of places listed on this card? For example, training in a business college, nurses program, an apprenticeship program, a vocational-technical institute, or any of these other kinds of sources?" [14]

Beginning in 1988, NLSY respondents were asked, [15]

"Since {date of last interview}, did you attend a training program or any on-the-job training designed to help people find a job, improve job skills, or learn a new job?"

Beyond these initial questions about training, both the NLS-OC and NLSY surveys ask respondents about the source and duration of training; however, between 1979 and 1986, the NLSY survey skipped most questions about training if respondents answered the following question with "No":

"Did you receive training from any of these sources for one month or more?"

As a result, the only information which is consistently available regarding all training for both cohorts across all years is (1) whether or not a respondent participated in training, and (2) whether that training lasted one month or more. So, for all respondents, I was able to construct measures of the following dimensions of training: incidence, whether the respondent ever participated in a training spell lasting more than one month, and the number of episodes of training a respondent reported. I was also able to measure the source of training for all training episodes lasting in excess of one month. Therefore, I was able to limit analyses of the effects of training from different sources to those respondents in "long-term" training (i.e., training lasting more than one month).

APPENDIX 2
HETEROGENEITY AND THE RETURNS TO TRAINING

One interpretation of the training returns presented in Table 3 is that they may, at least in part, be driven by worker or job heterogeneity. That is, training may be more common among better workers or those in "better" jobs or matches, and regardless of the effect of training, these workers enjoy higher earnings. Dealing with such heterogeneity has been a central concern for researchers attempting to estimate the returns to training and schooling.

The National Longitudinal Surveys offer a variety of means to control for this problem. For example, the NLSY data provide measures that allow for some direct control for job and worker attributes that are correlated with both training and earnings. First, the NLSY includes measures of the number of employees working for each respondent's employer. Employer size is known to be correlated with the probability a worker receives training (Barron, Black, & Loewenstein, 1987). Additionally, each of the NLSY sample members took the Armed Services Vocational Aptitude Battery (ASVAB) of tests. [16] From this battery, an Armed Forces Qualifying Test (AFQT) percentile score is calculated, which the U.S. Department of Defense uses as a general measure of trainability. The AFQT score has recently received considerable attention as a measure of skill (e.g., Neal & Johnson, 1996), and offers promise as a control for the possibility that the higher earnings of workers participating in training are due to higher than average skill levels.

As a first attempt to control for the possibility that more skilled, or trainable workers receive the most training, I estimated the earnings effect of training in a model which includes AFQT scores for the NLSY sample. I also included an indicator of whether a sample member worked for an employer with one thousand or more employees to limit the joint effect of job characteristics on training and earnings. The results of this estimation are included in Table A1. The first column presents estimates of the effects of the principal human capital measures, including job training on earnings. These are the results of Model 2 presented in Table 3. In the second column I present the results of the model that include individuals' AFQT percentile scores and the firm size measure.

Table A1
Returns to Training, with Test-Score and Firm-Size Controls: NLSY Cohort

	NLSY Cohort	**NLC-OS Cohort**
Intercept	**1.670***	**1.602***
	0.095	*0.095*
Experience	**0.019***	**0.010**
	0.006	*0.006*
High School Dropout	**-0.300***	**-0.177***
	0.048	*0.050*
Some College	**0.161***	**0.096***
	0.036	*0.038*
College	**0.430***	**0.264***
	0.043	*0.048*
AFQT Score	-	**0.004***
	-	*0.0006*
Firm with > 1,000 Employees	-	**0.101***
	-	*0.028*
Ever Received Training	**0.105***	**0.096***
	0.027	*0.027*
R-square	**0.2678**	**0.3075**

Controls also include marital status, SMSA residence, residence in the South, union status, FYFT status, veteran status, and a set of industry of employment dummies.

* Significant at 5% level

While employer size does not have a significant effect on earnings, clearly the AFQT percentile score is a powerful predictor of wages. Each unit increase in percentile ranking on the AFQT score is associated with a 0.41% increase in wages. This suggests that, after controlling for other factors, a worker scoring in the highest percentile on the AFQT will earn 41% more than the worker scoring in the lowest percentile.

Once these measures of skill and employer size are included, training still appears to have a sizable effect on earnings. Using these direct controls for heterogeneity, workers participating in training are estimated to earn 9.6% more than workers who never engaged in training. This estimate is lower than the previous estimate, although not significantly so. Interestingly, the inclusion of the AFQT and employer size measures has a more substantial effect on estimated returns to formal schooling. For example, the college premium falls from 43% to 26% and the earnings penalty for dropping out of high school falls from 30% to 18% upon inclusion of the skill and employer size measures. These results suggest that heterogeneity plays a marginal role in shaping observed returns to training for this group. This is consistent with several recent attempts to control for heterogeneity in the estimation of the earnings effects of training (see Constantine & Neumark, 1996, for a review).

For my purposes, the issue of heterogeneity concerns not only the extent to which point estimates are biased, but also whether any bias has become more or less severe over time. If the value of training as a signal of worker quality has changed, or if firms have changed the manner in which they allocate training resources, the bias associated with heterogeneity may have changed over time. Any change in the influence of heterogeneity could confound real changes in the returns of training in Table 3.

In order to examine this possibility, I make use of the longitudinal aspect of the NLS data and estimate fixed-effects models of the impact of training on the earnings of both the NLS-OC and NLSY cohorts. The principal results of this analysis are presented in Table A2. The fixed-effects models estimate that for the original cohort, participation in training increased wages by 10.6%. For the NLSY cohort, training was associated with a 12.5% increase in earnings.

Table A2
Alternative Estimates of the Returns to Training

	NLS-OC	**NLSY**
OLS Estimates	0.071 *	0.105 *
Fixed Effects	0.106 *	0.125 *

* Significant at 5% level

These results suggest that heterogeneity played a minor role at best in determining observed returns to training. Even after controlling for firm size; measurable worker skill; and now unmeasured, time-invariant worker characteristics, participation in training earns high returns for both cohorts. Moreover, the fixed-effects results confirm those presented in Table 3, that the returns to training were of similar magnitudes for both cohorts.

[1] These estimates agree with U.S. Department of Veterans Affairs (USDVA) reports of the population of veterans in comparable cohorts. Based on USDVA's annual Veteran Population in 1995, about 39% of men in the cohort from whom the NLS-OC data are drawn were veterans. Among men in the same cohort as the NLSY sample, 12% were veterans.

[2] One might expect combat to negatively affect earnings, either due to any lingering effects on productivity or because the measure of combat might pick up an important heterogeneity associated with the manner in which members of the armed forces are assigned to combat duty. While the coefficient on this variable is routinely negative in earnings models, it is never significant.

[3] The primary battery of questions about training in the NLSY did not include information on government-sponsored training between 1979 and 1986. Instead, another battery of questions was administered to collect information on participation in government training programs.

[4] I restricted my analysis to civilian training. As a result, I examined training which respondents reported was neither provided by the military, nor occurred while on active duty.

[5] For both the NLS-OC and NLSY data, "since the last interview" can exceed the one- or two-year survey interval because of non-interviews in any year.

[6] I analyzed the effect of interval length on the proportion of each sample reporting training by regressing the proportion reporting training on a time trend, and a measure of the time since the last cohort interview. For both cohorts, a two-year interview interval was associated with an additional 5% of the sample reporting training, over and above the trend.

[7] Here and throughout the paper I count individuals as having participated in long-term training if they ever participated in a training period of four weeks or more, even if they also participated in training that was shorter in duration at another time. I count individuals as participating in short-term training if they engaged in training lasting less than four weeks, at least once, and never engaged in training in a time period of more than four weeks.

[8] During some years, the NLSY asked detailed questions about training only for those reporting a duration of more than one month. In order to ensure comparability across years and cohorts, I restricted my analysis of the source of training to those who engaged in a spell of more than one month.

[9] For the purposes of estimating wage models, I employed measures of individuals' training histories for all years prior to the year for which I examined earnings. That is, I omitted from consideration any training in which workers engaged in the year during which wages are measured.

[10] For the same reasons it affects wages and hours, training might also affect labor force participation. If so, the marginal effect of training on wages and hours estimated here may be biased. To investigate this, I employed a series of two-stage Tobit models and estimated the marginal effect of training on wages, conditional on observing wages. I found no important differences between these conditional effects and the unconditional wage effects of training reported in Table 3. Because the two-stage models do not add new insight into the effect of training on employment outcomes here, I present only the unconditional results here to conserve space.

[11] Another interpretation is that any heterogeneity problem associated with determining who participated in training is particularly severe among workers without postsecondary education. That is, it may be that among less educated workers, only the most able or ambitious participate in training. If so, a relatively high level of such unobserved traits among less educated workers who get training could account for this relatively high wage premium associated with training among workers without postsecondary schooling. I examine this possibility by estimating group-specific models, while controlling for a measure of ability: Armed Forces Qualifying Test scores (see Appendix 1 for discussion). The results of that estimation also suggest that returns to training for less educated workers exceed the returns of their more educated peers.

[12] Interestingly, though, this result holds when AFQT test scores are included as controls for ability.

[13] In some years, respondents are asked about training since the particular month and year during which the last interview was fielded. In other years, the phrase "Other than regular schooling . . ." is omitted. In those years, the question is asked only of those not enrolled in school since the date of last interview.

[14] "Besides the training we've already talked about . . ." refers to batteries of questions about military training and government provided training (e.g., CETA and JTPA). I ignored the former training and included the latter in the measures of training I employ here.

[15] The 1987 survey did not ask about training.

[16] The ASVAB includes ten tests designed to measure skill and knowledge in areas such as general science, arithmetic reasoning, word knowledge, and mechanical comprehension (Center for Human Resource Research, 1995).